Research Paper

Volume : 3 | Issue : 4 | April 2014 • ISSN No 2277 - 8179

A Comparative Study on The Colour Fastness Properties of 100% Jute Fabric Using Reactive and Disperse Dyes

Home Science

KEYWORDS : Colour fastness, Disperse Dye, Jute, Reactive Dye

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ABSTRACT

Natural steam fiber jute is generally used for furnishing goods floor covering and decorative items. Rural and village peoples are highly skilled to make the crafts. This craftsman suffering to face the colour strength problem to manufactured the craft. In that problem can overcome using some chemical dyes. Reactive is an excellent fastness dye to light, wash and brilliants of shades. Disperse dyes are the organic coloring substances free from ionizing groups with low water solubility. This study focus the comparison of colour fastness properties of 100% jute Reactive Orange M2R dyed and disperse blue BN dyed fabric. These were investigated the colour fastness to crocking (dry and wet), perspiration (acid), Sunlight and Laundering. The dyed treated jute fabric was evaluated by AATCC method. From the analysis we observed the reactive dyed jute fabric shows very good result in colour fastness.

INTRODUCTION

The rural people are interested in craft works. They express their own creativity to do the craft items. Most of them create contemporary, traditional home decoration baskets and all purpose of tray, lamps, mat, and fashionable handbags. Jute fabrics are used for to manufacture those decorative things and so on. The main advantages are strong, durable, color, and light fast fiber, UV protection, sound and insulation, low thermal contention, and anti- static properties. It can also use as high performed technical textiles. Jute is an eco-friendly fiber which is easily bio degradable and it is reported by (Chakraborty, M.2001). Generally Jute is a multi-cellular fiber having mesh structure obtained from the bark of jute plant (Egerton, G.S. 1948). The fibers lies along the length of the plant stem in the form of an angular mesh work composed of more than one fibre layer. The commercial fibres obtained from the plant are 1.5-3 meters long (Gupta, R.V. 1992) So it act as eco- friendly and bio degradable. Jute contains Cellulose 58-63%, Semi cellulose 20 - 22%, Lignin12-14%, Proteins 0.8-2.5%, Waxes and fats 0.4-0.8%, Mineral matter 0.6-0.8% (Chatropadhay, D.P. 1998). A **dye** is a fluid or a substance for preparing a liquid which permanently fixes the colour on fabric dyeing a textile is a complex phenomenon involving the chemical and physical structure of the fiber as well as that of the dyes. The purpose of coloration is to effectively increase the attractiveness of the material or to protect the material or to differentiate it from other. Colors decide the customer attention makes an emotional connection and attracts them up to the product. Some of the chemical dyes are Reactive, Disperse, Basic, direct, acid, vat and so on. Fibers reactive dyes molecules become an integral part of cellulosic fibers. It's because of a chemical integrity of reactive dyes possess excellent washing fastness and dry cleaning properties (Hess, K.P. 1966), Jute acts a sensitizer like a reactive dye, which is known to accelerate the photo chemical degradation of cellulose through the formation of hydrogen Reactive dyes. Disperse dyes are characterize by low solubility in water but good solubility in dimethyl formamide, acetone etc. The dispersion stability depends on the dye structure, the finishing process and dispersing agents used along with the dye (Wingate, I.B.1976) These studies reports the comparison of colour fastness in Reactive Orange M2R dye jute fabric and disperse blue BN dyed jute fabric. The dyed treated jute fabric was evaluated by AATCC method. The present study was carried out to apply the Reactive and disperse dyes in 100% jute fabrics are associated the colour fastness tests.

MATERIAL AND METHODS

MATERIALS

The fabric selected for this study was bleached 100% jute fabric, Reactive orange M2R; disperse Blue BN were selected dyes for this study.

REACTIVE DYE

The reactive dye was taken in a vessel and little hot water was added and made into a past. One gram of dye was added to the hot water and stirred well at the temperature of 80 °C. The dye bath contain cold water with the material liquor rate of 1:20 and the as- prepared dyed solution was added to this dye bath. After those 40 grams per liter common salt was added to the same dye bath. Stirred the dyes well and the dye bath fabric was immersed and kept for 15 minutes. 5 grams per liter of soda ash and 1.5 grams per liters of caustic soda were added to the above dye bath and dyeing was continued for 30-40 minutes. Finally the fabric was removed and washed in cold water.

DISPERSE DYES

Disperse dyes were dissolved by the first mixing with hot water or an aqueous hot solution of dispersing agent. Then by adding boiling water the dye bath was prepared with a required amount of dye. The fabric liquor ratio was maintained at 1:20, before immersing the fabric in the dye bath it was soaked well in distilled water and squeezed for even absorption. Dyeing was started by entering the material is lukewarm dye bath (30 -40 °C) the temperature was raised up to 80 °C for 30 minutes and occasionally stirred by a glass rod, then allowed to cool down. It was then rinsed in cold distilled water and dried at room temperature.

COLOUR FASTNESS TESTS

AATCC method test specimen required colour fastness tests namely, Crocking (dry and wet), Perspiration (acid), laundering, and Sunlight specimen was tested the control of evaluation. The colour change and colour transference of the specimen sample were analyzed.

COLOUR FASTNESS TO CROCKING (DRY AND WET)

The crocking test was done using a rectangle testing device called the "Crock Meter" A reactive dyed specimen 12 inch by 4 inch was cut from the samples and was fixed firmly on the surface of the table, a dry, white, cotton material measuring 2 inches by 2 inches, was mounted at end of the testing device, 20 times apply pressure evenly at uniform speed. For wet crocking, the test was repeated with white cotton material, previously wetted with distilled water and tied to the wooden block. The excess water was removed from the white pieces of fabric by processing between folds of a blotting paper. The cloth was later dried; the experiment was carried out in the same manner as that of dye crocking.

COLOUR FASTNESS TO PERSPIRATION

The effect of perspiration test samples measuring 2.5 inches by 4 inches were cut from each of the dyed fabrics and attached to a white cotton cloth of similar dimensions. Two specimens

were cut from each of the dyed fabrics and were treated acid perspiration. Separately and allowed to dry slowly at a slightly elevated temperature.

COLOUR FASTNESS TO LAUNDERING

Colour change and colour transference when subjected to laundering. The sample was cut out 6 inch x 2 inch dimension and a white cotton cloth of the same measurement was attained on both sides of the dyed sample this was to find out colour transference if any. Each test sample was treated for this individually. 5% surf solution was prepared and 200cc of tap water was added and kept at 60 °C. The test samples were soaked in this solution for half an hour with occasional kneading and squeezing. It was then rinsed well in tap water with three changes of water, and dried at temperature.

COLOUR FASTNESS TO SUNLIGHT When exposed to sunlight. Test specimens measuring 8 inches by 3 inches were cut out from the dyed fabric. Each test specimen was fixed on to a white cardboard and covered by plain glass to protect it from direct dirt and other deterioration agent. The specimens were placed on a horizontal plane in an open area. So that the sun's rays could fall directly on these, the specimens were exposed to sunlight from 9.00 am to 8.00 pm for one week, and then the sample was compared with the control sample for colour fading.

GUIDE FOR SPECTROPHOTOMETER RATING:

5 –Negligible rate of colour change or transference
4 –Very little rate of colour change or transference
3 –Little rate of colour change or transference
2 –Appreciable rate of colour change or transference
1 –Objectionable rate of colour change or transference

STATISTICAL ANALYSIS:

The results were subjected to statistical analysis. The analysis was done using student't' Test at 1% level of significance.

Where,

$$t = \frac{x-y}{S\sqrt{\frac{1}{n1}+\frac{1}{n2}}}$$

RESULTS AND DISCUSSION

AATCC standard test method for colour fastness to dry and wet, Acid perspiration, Laundering, Sunlight test was done on the jute dyed samples M2R and BN was shown the result in colour change and Colour transference represents (TABLE1 & 2)

TABLE 1: COLOR FASTNESS COLOR CHANGE

Dyed Fabric	Samples	Color Change				
		Mean	Std. Dev	T Value	Sig. value	
Color fastness to crocking (Dry)	M2R	4.2		.273	8.50	.000*
	BN	2.5		.353		
Color fastness to crocking (Wet)	M2R	3.2		.273	6.95	.000*
	BN	2.1		.223		
Color fastness to Acid Perspiration		M2R	3.7	.273	5.77	.000*
	BN	2.1	.223			
Color fastness to Laundering 60^0C		M2R	4.3	.273	6.50	.000*
	BN	3	.353			
Color Fastness to Sunlight		M2R	4.4	.273	16.2	.000*
	BN	2.1	.223			

TABLE 2: COLOR FASTNESS COLOR TRANSFERENCE

Dyed Fabric	Samples	Color Transference			
		Mean	Std. Dev	T Value	Sig. value
Color fastness to crocking (Dry)	M2R	4.4	.22361	7.483	.000*
	BN	3	.35355		
Color fastness to crocking (Wet)	M2R	3.8	.22386	6.261	.000*
	BN	2.4	.41833		
Color fastness to Acid Perspiration	M2R	4.3	.22386	6.261	.000*
	BN	3.2	.27386		
Color fastness to Laundering 60^0C	M2R	4.3	.22386	4.427	.000*
	BN	2.9	.65192		
Color Fastness to Sunlight	M2R	-	-	-	-
	BN	-	-		

M2R- Reactive Orange, BN- Disperse Blue

Colour fastness to crocking:

Colour change: Reactive orange M2R dyed jute fabric, shows 4.2 (dry) and 3.2 (wet) rating, disperse blue BN dyed jute fabric shows 2.5 (dry) and 2.1 (wet) appreciable rates of colour changes.

Colour transference: Reactive orange M2R dyed jute fabric, shows 4.4 (dry) and 3.8 (wet) rating, disperse blue BN dyed jute fabric shows 3 (dry) and 2.4 (wet) appreciable rate of colour transference.

Colour fastness to perspiration (acid):

Colour change: Reactive orange M2R dyed jute fabric, shows 3.7 rating, disperse blue BN dyed jute fabric shows 2.7 rate of colour change.

Colour transference: Reactive orange M2R dyed jute fabric, shows 4.3 rating, disperse blue BN dyed jute fabric shows 3.2 rate of colour transference respectively.

Colour fastness to laundering at 60^0C:

Colour change: Reactive orange M2R dyed jute fabric, shows 4.3 rating, disperse blue BN dyed jute fabric was shows 3 rate of colour change.

Colour transference: Reactive orange M2R dyed jute fabric, shows 4.3 rating, disperse blue BN dyed jute fabric was shows 2.9 rate of colour transference respectively.

Colour fastness to sun light Colour change: Reactive orange M2R dyed jute fabric, shows 4.4 rating, disperse blue BN dyed jute fabric was shows 2.1 appreciable rate of colour change.

FIGURE 1(Compare to Colour change and Transference)

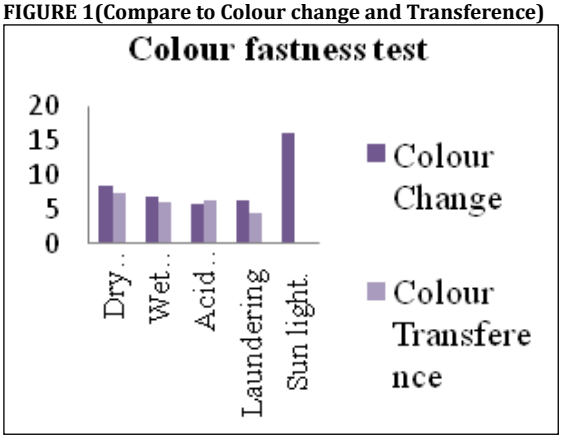


FIGURE 1 dry crocking, wet crocking, acid perspiration, laundering, sun light shown reactive orange M2R showed good result in colour change and colour transference followed by disperse blue BN.

CONCLUSION

The purpose of this study was to select the optimum dyeing condition of jute with reactive dyes and Disperse colour fastness properties examined in the laboratory test. The dyed jute samples were compared with the colour fastness of the dyed samples to various influences such as, crocking (dry and wet), perspiration (acid) laundering and Sunlight colour change. Colour transference was evaluated using AATCC standard grey scale. From the analysis of the result, it can be concluded that with regard to, reactive orange M2R dyes gave the best results compared with disperse blue dyes.

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